H53J-1900 - Variations in Soil $^{87}Sr/^{86}Sr$, and its Influence on Stream Water Geochemical Evolution in Eight Rapidly Urbanizing Watersheds in Austin, TX

Friday, 13 December 2019

13:40 - 18:00

Moscone South - Poster Hall

Abstract

Understanding urbanization impacts on the natural hydrologic cycle is imperative for maintaining resilient freshwater resources, especially as the growing global population concentrates in urban centers and as climate extremes continue through the 21st century. This study uses endmember elemental concentrations and $^{87}Sr/^{86}Sr$ values to understand the influence of municipal (supply and waste) water and soil leachates on urban stream water compositions in eight Austin, Texas watersheds. Elevated $^{87}Sr/^{86}Sr$ values in urban stream waters are hypothesized to be modulated by either 1) leakage of municipal (supply and waste) water and/or irrigation runoff, or 2) by interacting with naturally elevated soil $^{87}Sr/^{86}Sr$ values, both of which exhibit higher $^{87}Sr/^{86}Sr$ values than the Cretaceous limestone which the studied streams incise. Here we determine $^{87}Sr/^{86}Sr$ values for both irrigated and unirrigated soils, and compare results to municipal (supply and waste) water, soil type, and the degree of urbanization within each watershed. For almost all soil types (n=10), the range and average of unirrigated soil $^{87}Sr/^{86}Sr$ values are lower than irrigated soils. In densely urbanized watersheds (>57% developed land; n=3), unirrigated soils have elevated $^{87}Sr/^{86}Sr$ values that are either 1) greater than municipal water and/or 2) greater than both irrigated soils and municipal water, suggesting that many unirrigated soils within densely urbanized watersheds are likely amended via urban development. In watersheds with <48% developed land, irrigated soils generally have higher $^{87}Sr/^{86}Sr$ values (0.7080-0.7092) than unirrigated soils (0.7078-0.7085), suggesting that irrigation with municipal water resets soil composition over time. In this case, high stream water $^{87}Sr/^{86}Sr$ values originate from municipal water (i.e., Hypothesis 1 above) in at least five of the Austin area watersheds. Overall increases in both soil leachate and stream water $^{87}Sr/^{86}Sr$ values correlate with increased watershed-scale urbanization, consistent with increases in municipal water influence on stream water composition as urban development continues.

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